

PLEISTOCENE NON-MARINE MOLLUSCS FROM COVA DE CA NA REIA, EIVISSA

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KEY WORDS: Pleistocene, molluscs, Eivissa.

SUMMARY. Fourteen taxa of non-marine molluscs from Cova de Ca Na Reia, Eivissa are described, including two new to science: *Trochoidea (Xerocrassa) ebusitana gasulli* subsp. nov. and *Oesteophora dentata* sp. nov. The fauna is probably of Lower Pleistocene age and lived during an interglacial period adjacent to, but not in, the cave.

RESUM. MOL·LUSCS NO MARINS DEL PLEISTOCÈ DE LA COVA DE CA NA REIA. S'ha estudiat la malacofauna no marina del jaciment de la Cova de Ca Na Reia. S'hi han detectat 14 taxa; n'hi ha dos nous per a la ciència: *Trochoidea (Xerocrassa) ebusitana gasulli* subsp. nov. i *Oesteophora dentata* sp. nov. Es discuteix la significació estratigràfica i ecològica de la fauna de la Cova de Ca Na Reia.

INTRODUCTION

The non-marine mollusc fauna described in this paper was originally discovered during an expedition to recover fossil vertebrates. The presence of molluscs was briefly reported (TORRES & ALCOVER, 1981; GASULL & ALCOVER, 1982) and it was intended that Señor Gasull would describe them thoroughly. Unfortunately Señor Gasull died before he could complete this work and Dr. Alcover very kindly invited me to do so. All the fossil molluscs were sent to me, but I have not seen the cave deposits in which they were found. I should like to dedicate this paper to the memory of Señor Gasull in recognition of his prolonged study of Balearic molluscs, both fossil and Recent.

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The mollusc fauna at Cova de Ca Na Reia is particularly important because it is only the second older Pleistocene fauna so far discovered on Eivissa and because it adds substantially to the total number of species of fossil non-marine molluscs known. *Leiostryla* sp., *Trochoidea* (*Xerocrassa*) *ebusitana gasuilli* subsp. nov., *Limax majoricensis*, *Theba pisana*, *Sphincterochila candidissima* and *Otala punctata* are recorded for the first time, while a previously reported species, "*Helicondontinae* sp., A", PAUL, 1982, is identified as *Oestophora* cf. *boscae*. The age of the fauna is still not fully settled, but it must be at least pre-Würm. Undoubtedly it is of a very similar or identical age to the first older Pleistocene fauna discovered at Cala Salada, Eivissa (PAUL, 1982).

The deposit which yielded the molluscs is a cave breccia, more or less lithified by a calcareous cement. The fossils are preserved as internal moulds, moulds with some shell material still adhering, well preserved shells with colour bands, or as shell material of a uniform dark grey colour. Some species exhibit all types of preservation, others only one type. It is possible that the fauna is not all of the same age. Certainly among the material was a single fragment of *Oxychilus pityusanus* which is so fresh and transparent that it must be a Recent contaminant. The preservation of material is recorded for each species in case it should prove to be significant in the future (table 1). As at Cala Salada, dark grey shell material appears to include the best preservation of original shell structure, with internal growth lines and fine surface details such as hair pits still evident. Specimens are deposited at Barcelona University, with a small representative collection at the Sedgwick Museum, Cambridge, England.

The precise age of the fauna is difficult to establish. However, something of its relative age can be settled by comparison with other Pleistocene faunas in the Balearic Islands. In Menorca and Mallorca *Rumina decollata* only occurs in the oldest of the Pleistocene deposits (CUERDA, 1975). It appears to have become locally extinct by the Middle Pleistocene. In Menorca *R. decollata* is accompanied by *Tudorella ferruginea* and a species of *Otala* (BOURROUILH & MAGNÉ, 1963; MERCADAL *et al.*, 1970 and personal collecting). The next younger faunas in Menorca contain *Mastus pupa*, which is considered to be characteristic of the Würm and possibly older (MERCADAL *et al.*, 1970, p. 90). Certainly it does not occur in the oldest deposits, nor in the youngest Pleistocene and post glacial deposits. In Eivissa a similar situation obtains although no record of *Mastus* is known. The vast majority of deposits which yield non-marine molluscs are obviously not very old (late glacial or post glacial) and contain only the endemic helicelline species and, rarely, the endemic zonitid, *Oxychilus*

Table 1.

Species	Preservation				
	shells		moulds		
	with colour	white	dark grey	with shell	without shell
<i>T. ferruginea</i>		+	+	+	+
<i>Leiostyla</i> sp.		+			
<i>O. pityusanus</i>				+	+
<i>L. ?majoricensis</i>		+			
<i>R. decollata</i>				+	+
<i>S. candidissima</i>		+		+	+
<i>T. e. ebusitana</i>			+	+	
<i>T. e. gasulli</i>		+			
<i>T. caroli</i>	+	+	+		
<i>O. dentata</i>		+			
<i>I. minoricensis</i>		+		+	
? <i>T. pisana</i>				+	
<i>O. punctata</i>	+	+	+		+
<i>H. aspersa</i>					+

pityusanus. Only at Cala Salada, and now at Cova de Ca Na Reia, is there a varied fauna and this contains *Rumina decollata*, *Tudorella ferruginea*, *Otala punctata* and a variety of other species. The simplest hypothesis is that it is of the same age as deposits with these three species in Mallorca and Menorca, i.e. early to middle Pleistocene.

SYSTEMATIC PALAEONTOLOGY

SUBCL. PROSOBRANCHIA

FAM. POMATIIDAE

Tudorella ferruginea (Lamarck, 1822) (figures 1-2)

DESCRIPTION. Shell (figure 1) conical, turritid, up to six moderately tumid whorls. Apex rounded, smooth for the first two whorls (figure 2d), then characteristic spiral ridges and weak growth lines begin and become progressively stronger (figure 2e). 16 and 24 ridges occur on the penultimate whorl above the aperture on the two examples where the number can be counted. The

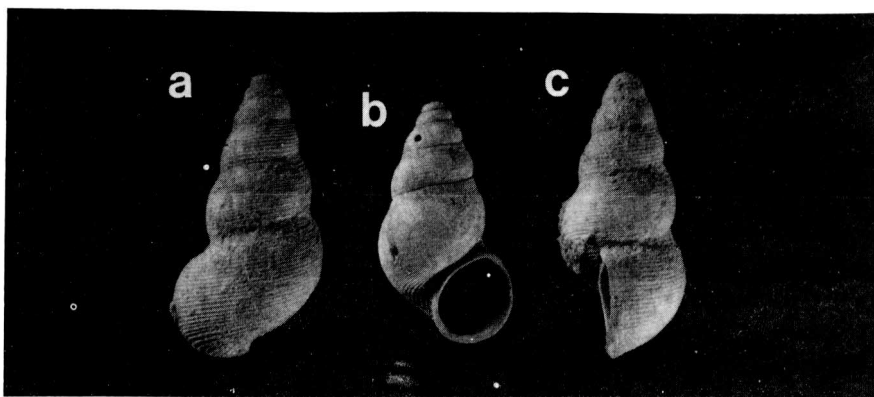


Fig. 1.— *Tudorella ferruginea* (Lamarck, 1822), dorsal (a), apertural (b) and lateral (c) views of two shells. (a) and (c) the same specimen. Specimens whitened with ammonium chloride sublimate for photography. Approximately x2.

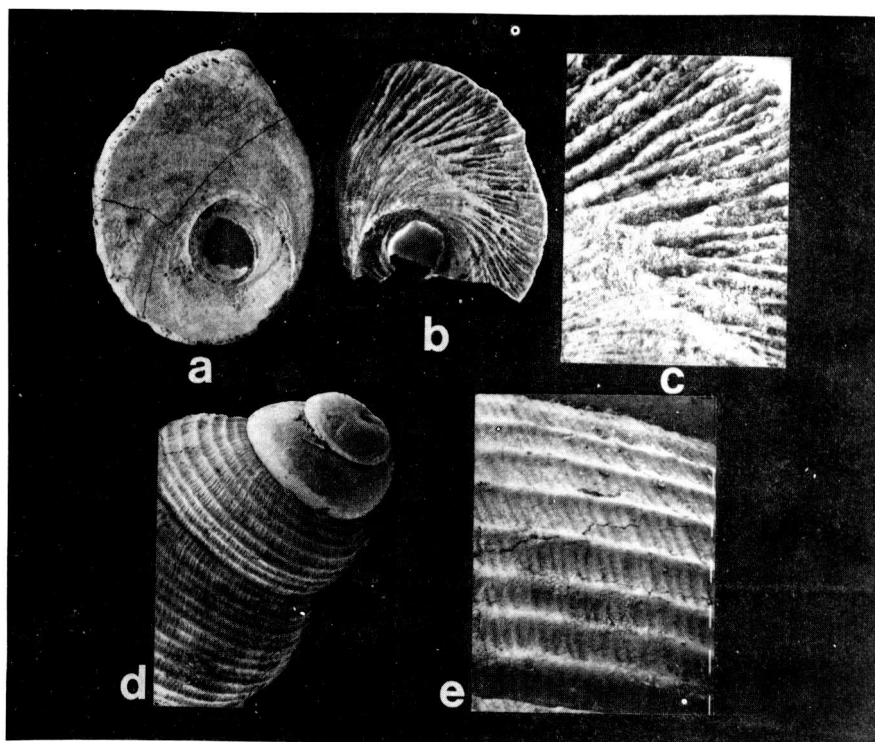


Fig. 2.— *Tudorella ferruginea* (Lamarck, 1822), scanning electron micrographs of opercula (a-c) and shells (d-e). (a) Internal surface of operculum, x8. (b) External surface of operculum, x8. (c) Detail of external lamellae, x19. (d) General view of apex of shell to show smooth initial whorls, x10. (e) Detail of surface ornament on fourth whorl, x38.

grooves are about twice as wide as the spiral ridges. The aperture is entire, rounded, the lip not thickened and scarcely reflected (figure 1b). The parietal wall is only connected to the penultimate whorl at the suture. The plane of the aperture lies at 15° to the axis (figure 1c). Cova de Ca Na Reia shells reach 22.1 mm by 12.3 mm.

The operculum (figure 2a-c) consists of a single layer, smooth and weakly concave internally, spiral with two whorls of prominent growth lamellae externally. Growth lamellae line the parietal wall of the aperture and the operculum is about twice as thick at the growing edge as it is one whorl previously. Growth lamellae stand up as narrow vertical ridges on the external surface, often branch and are separated by deep, narrow grooves near the periphery but touch proximally (figure 2c). Opercula are markedly thinner at the centre of growth and all but one of the fossil opercula are perforated centrally (figure 2a). The perforations are irregular and most likely represent preservational effects rather than predation. Opercula of Recent shells are very thin centrally. Fossil opercula reach 7mm. by 6mm.

MATERIAL. 45 opercula, 5 more or less complete shells and many fragments that include 20 apices, plus common partial internal moulds.

REMARKS. These shells are virtually identical to those from Cala Salada and Recent examples from Menorca. Examples from both fossil sites are slightly larger than typical Recent shells.

SUBCL. PULMONATA

FAM. PUPILLIDAE

Leiostyla sp. (figure 3)

DESCRIPTION. Shell small, ovoid, with at least 4.5 (probably originally 6-7) whorls. Apex missing, lower whorls slightly tumid, with scarcely impressed sutures, delicately but distinctly striate (figure 3b). Ridges parallel to the lip of the aperture and steeper facing the aperture than facing the apex. Body whorl damaged, but the aperture was constricted and had two parietal lamellae, the upper one fused to the top of the palatal margin which is missing (figure 3a). There is one columellar lamella and hints of a weak tooth above it. The shell is now 2.0mm in diameter and was originally about 3.5mm high.

MATERIAL. 1 incomplete shell.

REMARKS. This shell is more strongly striate than *L. anglica*. Its precise identity remains uncertain due to its incompleteness and damage.

FAM. ZONITIDAE

Oxychilus (Oxychilus) pityusanus Riedel, 1969 (figure 4)

DESCRIPTION. Shell discoidal, very thin and shiny, almost flat above and slightly rounded below (fig. 4b) with a moderate umbilicus about 1/6 the shell diameter (fig. 4c). 3.5-4.5 whorls with weakly impressed sutures. The aperture is oval, neither thickened nor reflected and the plane of the aperture lies at 30° of the axis. The largest example is 10mm in diameter.

MATERIAL. One apex with shell preserved, one complete internal mould and one nearly complete external mould preserved within the fill of a shell of *Tudorella*. In addition there is one small shell fragment that is so fresh and translucent that it must be a Recent contaminant of the fossil material.

REMARKS. The few fossil shells are quite typical of the species which is endemic to the Pityuse Islands.

FAM. LIMACIDAE

Limax ?majoricensis (Heynemann, 1863) (figure 5)

DESCRIPTION. Shell a small oval plate, just under twice as long as wide and reaching 5.3mm by 2.8mm. The ventral surface (figure 5b) is weakly concave or almost planar and irregular; the dorsal surface (figure 5a) is weakly convex and shows partly concentric growth lines about an excentric nucleus at the anterior right edge, which appears to have been resorbed slightly. The long axis of the growth lines has changed orientation slightly during growth and corresponds to a clockwise spiral in dorsal view. The shell is moderately thick with an irregular anterior inflection which houses a groove. The widest part of the shell is generally nearer the posterior end and there is often a weak peripheral groove.

MATERIAL. 22 shells attributable to this form and another 8 shells which may also be this species.

REMARKS. All the slug shells available show asymmetrical growth characteristic of limacid slugs. Most are fairly thin, none is biconvex and they can fairly confidently be assigned to the genus *Limax*. The specific identity is much more doubtful. Slug shells are notoriously difficult to identify. However, as *Limax majoricensis* is the only species of the genus endemic to the Balearic Islands (GASULL & ALTEA, 1969) and therefore presumably colonized or evolved on the islands, a long time ago, it is the most obvious choice. I have seen no Recent shells of *L. majoricensis* for comparison.

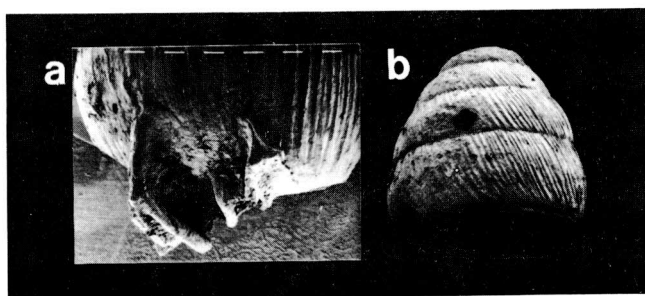


Fig. 3.— *Leiostylus* sp. Scanning electron micrographs of the aperture (a) and upper whorls (b) of the only known specimen. (a) x19, (b) x38.

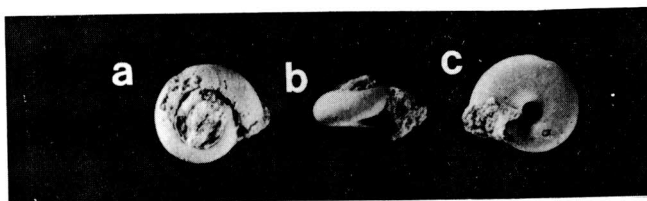


Fig. 4.— *Oxychilus* (*Oxychilus*) *pityusanus* Riedel, 1969, Dorsal (a), apertural (b) and ventral (c) views of an internal mould. Whitened with ammonium chloride sublimate for photography. Approximately x2.

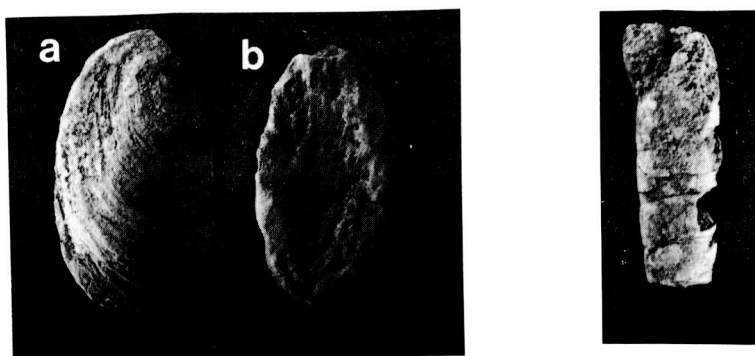


Fig. 5.— *Limax* ?*majoricensis* Heynemann, 1863, scanning electron micrographs of the dorsal (a) and ventral (b) surfaces of shells, (a) x8, (b) x10.

Fig. 6.— *Rumina decollata* (Linn., 1758), apertural view of most complete individual. Whitened with ammonium chloride sublimate for photography. Approximately x2.

A further 8 shells occur which are proportionately slightly broader, generally thinner and usually lack the anterior groove. They reach 5.3mm by 3.6mm, but are generally rather similar. They may possibly represent a second species, but it is difficult to tell them apart. Provisionally I am accepting only one fossil species of slug in the fauna.

FAM. SUBULINIDAE

Rumina decollata (Linnaeus, 1758) (figure 6)

DESCRIPTION. Shell turritid, almost cylindrical, decollate. Adult portion of five whorls which are scarcely tumid and have weakly impressed sutures. The whorls are ornamented with irregular growth lines. The aperture is oval, the angle of the plane of the aperture is not determinable. The solitary mature example from Cova de Ca Na Reia is 25.0mm high (estimated 28mm complete) by 9.5mm maximum diameter and is 6.4mm in diameter at the point of decollation. Another example is 5.8mm in diameter at decollation.

MATERIAL. One internal mould of a nearly complete shell with some shell adhering and fragmentary internal moulds of five other examples, including three apices.

REMARKS. *R. decollata* is surprisingly rare at Cova de Ca Na Reia, but unmistakable. The solitary nearly complete example is about the size of modern *R. decollata* and not significantly smaller as the shells from Cala Salada are (see PAUL, 1982, p. 171). However, with only one shell it is impossible to comment on the average size of the population.

FAM. SPHINCTEROCHILIDAE

Sphincterochila candidissima (Draparnaud, 1801) (figure 7)

DESCRIPTION. Shell globular, heliciform, rounded above and below (figure 7b). Four moderately tumid whorls, the last descending dramatically just before the aperture. Surface smooth, shiny and with irregular growth lines, opaque white. The aperture is oval, the palatal lip reflected and thickened with a very thick, plate-like basal margin. The plane of the aperture is very oblique and lies at 67° to the axis. Adult shells lack an umbilicus (figure 7c), the lip callus being reflected over the axis, but juveniles (and internal moulds, e.g. figure 7f) possess a narrow umbilicus. Shells from Cova de Ca Na Reia reach 20-21mm in diameter by 13-14mm high.

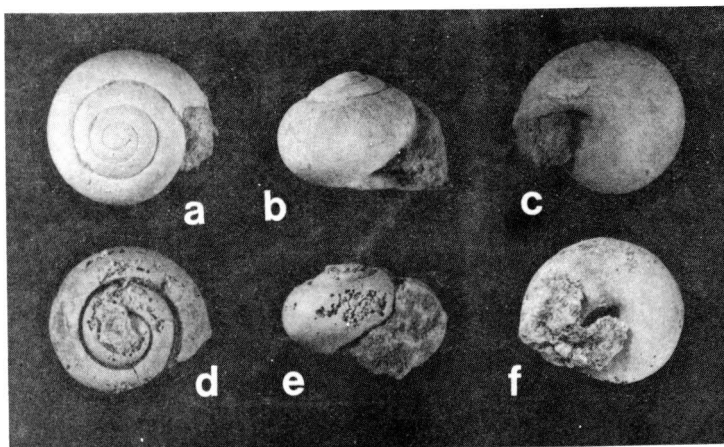


Fig. 7.— *Sphincterochila candidissima* (Draparnaud, 1801). (a-c) Dorsal, apertural and ventral views of a nearly complete shell. (d-f) The same views of slightly incomplete internal mould. All whitened with ammonium chloride for photography. All approximately x1.5.

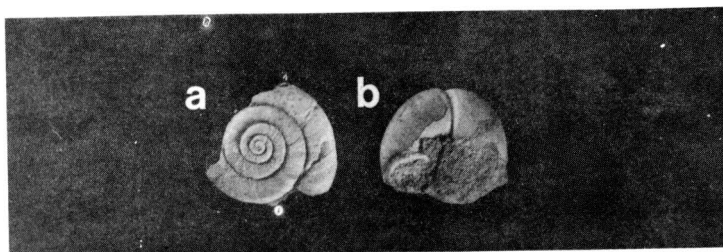


Fig. 8.— *Trochoidea (Xerocrassa) ebusitana* (Hidalgo, 1869). (a) Dorsal view of most complete shell fragment. (b) ventral view of internal mould. Both whitened with ammonium chloride sublimate for photography, both approximately x2.

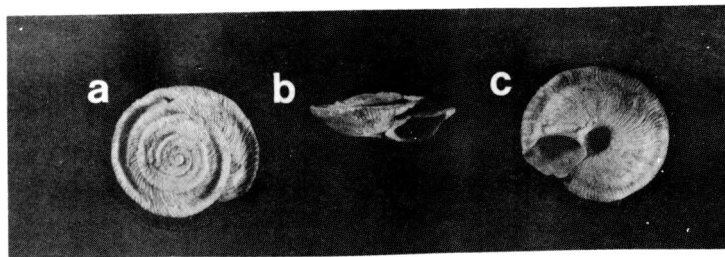


Fig. 9.— *Trochoidea (Xerocrassa) ebusitana gasulli* subsp. nov., dorsal (a), apertural (b) and ventral (c) views of the holotype, a complete and well preserved shell. Whitened with ammonium chloride sublimate for photography. Approximately x2.

MATERIAL. One nearly complete shell, 11 apices and juveniles shells and six internal moulds.

REMARKS. The nearly complete shell is typical and shows the almost smooth, opaque white shell characteristic of *S. candidissima*. Internal moulds (figure 7d-f) reveal that the shell is relatively thick, another character of species of *Sphincterochila*.

FAM. HELICIDAE

SUBFAM. HELICELLINAE

Trochoidea (Xerocrassa) ebusitana ebusitana (Hidalgo, 1869) (figure 8)

DESCRIPTION. Shell discoidal, slightly conical above, rounded below, with a moderately wide umbilicus about 1/5 the shell diameter. Early whorls flat above and distinctly keeled, last whorl rounded at the periphery and descending to the aperture. Sutures weakly impressed. Five whorls ornamented with irregular, backwardly curving striae above, and more weakly below, the periphery. Shell surface shiny. The largest shell from Cova Na Reia also has several interruptions to growth. The aperture is rounded with a prominent internal rib within the palatal lip. The plane of the aperture lies at 37° to the axis. The largest shells are 14mm by 9mm high, as at Cala Salada.

MATERIAL. One nearly complete shell, two mature partial internal moulds and five more apices of shells.

REMARKS. The shells from Cova de Ca Na Reia are quite typical of the species. The largest shell (figure 8a) is uniformly dark and shows interruptions to growth. The most complete internal mould (figure 8b) shows two internal ribs again revealing that growth was discontinuous. It is possible that conditions were not ideal for this species while the deposits were forming.

Trochoidea (Xerocrassa) ebusitana gasulli subsp. nov. (figures 9-10)

DESCRIPTION. Shell discoidal with a prominent raised keel, flat above, weakly rounded below (figure 9b). 5 whorls ornamented with prominent backwardly curving riblets above and below (figures 9a, c). Periphery forming a constricted keel which is raised up almost vertically in places on the upper surface so that the shell assumes a pagodiform outline as in *Rossmassleria*. The whorl outline is concave immediately below the keel (figure 9b), then is gently convex down to the narrow umbilicus which is about 1/7 the shell diameter (figure 9c). The aperture is shaped like a trapezium and continues into the

keel. The plane of the aperture lies at 55° to the axis, but the last whorl does not descend to the aperture. The complete shell is 15.8mm in diameter and 5.0mm high.

MATERIAL. Two shells, one of which is mature and is designated the holotype (figure 9), plus one apex (figure 10a, b) and some small shell fragments (e.g. figure 10c). All preserved as shell material.

REMARKS. This subspecies is very distinctive. It resembles forms of the genus *Rossmassleria* in general shape and size, but has far too coarse ribbing. It is also very similar to *Tyrheniberus sardonius* (Martens) from Sardinia, but has one whorl more despite being about 2mm smaller in diameter than the smallest *T. sardonius* measured by PFEIFFER (1946, p. 28). Other keeled species of *Trochoidea* (*Xerocrassa*), such as *T. (X.) nyeli* are generally smaller and less coarsely ribbed. Despite its very different appearance, I think this form is a variant of *T. (X.) ebusitana*. Keeled races of *T. (X.) ebusitana* have been described by JAECKEL (1952), GASULL (1964 b) and SCHRÖDER (1978). GASULL (1964b, p. 19) described a Recent form as *Helicella (Xeroplexa) ortizi*, which SCHRÖDER (1978, p. 92) regarded as a subspecies of *T. (X.) ebusitana* on anatomical grounds. This form is confined to the northeast of Eivissa and is characterized by the presence of a more or less well developed keel on the last whorl. Some extremely flat forms resemble *Rossmassleria* in general shape (see GASULL, 1964b, pls 1-3) and the present form is very similar to them, but has fewer whorls, a different apical sculpture (fig. 10a), stronger ribbing and an even more *Rossmassleria*-like shell. SCHRÖDER (1978) thought that these extremely flat forms were subfossil and not closely related to subspecies *ortizi*. As far as I am aware, typical *ebusitana* and these extremely flat forms do not co-exist at present, whereas both *ebusitana* and the new keeled subspecies, *gasulli*, are found in the cave deposits at Cova de Ca Na Reia. If they originally coexisted, it is possible that *gasulli* represents a distinct species, but this is by no means certain.

***Trochoidea (Xerocrassa) caroli* (Dohrn & Heynemann, 1862) (figure 11)**

DESCRIPTION. Shell globular, distinctly conical above, rounded below, with a narrow umbilicus about 1/10 the shell diameter (fig. 11c). 5-5.5 moderately convex whorls, flatter above and ornamented with coarse, irregular, backwardly curving riblets (fig. 11a); rounded and only weakly striate below. The aperture is lunate with a thickened internal rib inside the palatal lip (fig. 11b). The last whorl does not descend to the aperture, the plane of which lies at 35°

to the axis. Shells preserve their original colour patterns of 4-6 narrow spiral bands above the periphery which are generally broken up to form an irregularly mottled pattern; a prominent, broad and continuous band just below the periphery, and 2-4 narrower continuous bands between the broad one and the umbilicus. Fossil shells reach 11mm diameter by 7.2mm high.

MATERIAL. Three nearly complete shells, six other apices and two fragments, all preserved as shell material.

REMARKS. Again the fossil shells are quite typical. This species is more globular, more coarsely striate and has a narrower umbilicus than *T. (X.) ebustitana*. Both species are endemic to the Pityuse Islands at present.

SUBFAM. HELICODONTINAE

***Oestophora dentata* sp. nov.**

?*Oestophora* att. *kuiperi* Gasull, Esu, 1978 p. 27, figures 20 a-c

Helicodontinae sp. A. Paul, 1982, p. 179.

Oestophora (Subestophora) sp. Gasull and Alcover, 1982, p. 42.

DESCRIPTION. Shell discoidal, flat above, rounded below (figure 12b) with a wide umbilicus about 1/3-1/4 of the diameter (figure 12c). 5.5-6 whorls with the periphery almost level with the impressed sutures. Upper surface (fig. 12d) ornamented with strong, regular, backwardly curving riblets which pass over the periphery and descend obliquely but become less prominent laterally and below. Widely scattered hair pits arranged in forward curving rows show on the best preserved examples, which also reveal a very fine oblique sculpture between the ribs. The last whorl descends abruptly just before the lunate aperture which is constricted just behind the palatal lip to form an internal rib that bears a blunt tooth centrally. The lip is also reflected and a little thickened. The parietal callus is thin. The plane of the aperture is slightly concave and lies at 46° to the axis. Umbilicus wide and deep, the last whorl uncoiling slightly as seen in ventral view. Shells from Cova de Ca Na Reia reach 12.5mm in diameter by 6.3mm high, but the latter measurement is considerably increased by the reflected lip of the aperture.

MATERIAL. Three nearly complete shells, of which the one illustrated in figures 12 a, b is designated holotype, three apices and one internal mould.

REMARKS. This is a very distinctive species and undoubtedly the same form as 'Helicodontinae sp. A' (PAUL, 1982) from Cala Salada. No example from the latter locality preserves the aperture so the specific identity was originally

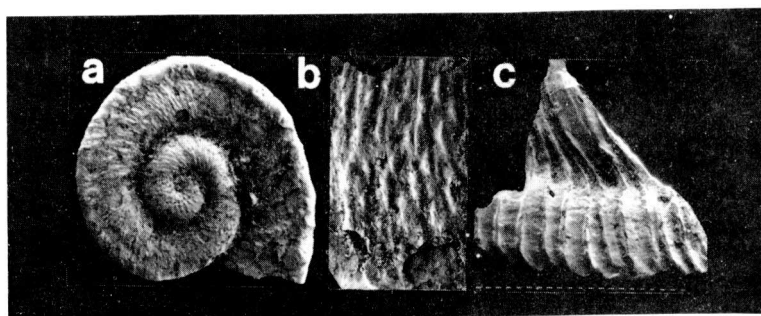


Fig. 10.— *Trochoidea (Xerocrassa) ebusitana gasulli* subsp. nov. Scanning electron micrographs of the apex (a-b) and a shell fragment (c) to show details of surface ornament. (a) x8, (b) x76, (c) x10.

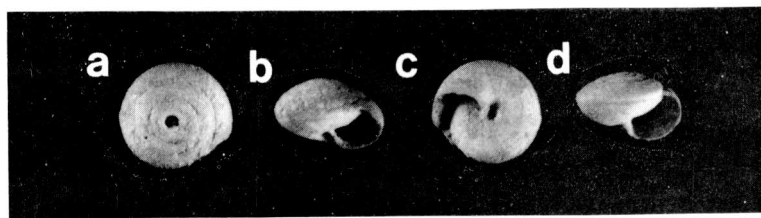


Fig. 11.— *Trochoidea (Xerocrassa) caroli* (Dohrn & Heynemann, 1862). (a-c) Dorsal, apertural and ventral views of the same shell. (d) Apertural view of an immature example. Both whitened with ammonium chloride sublimate for photography. All figures approximately x2.

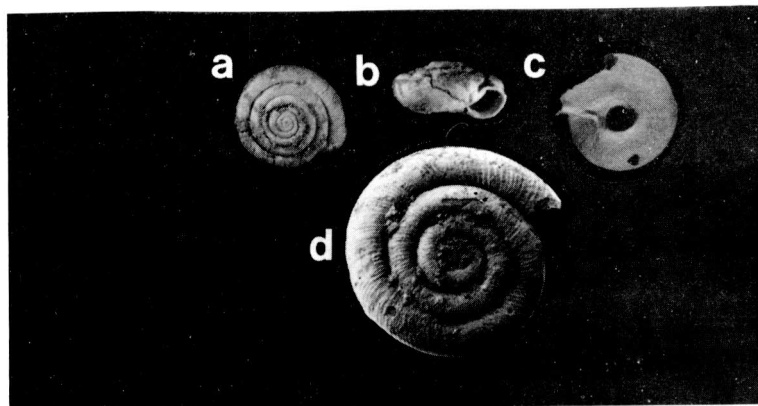


Fig. 12.— *Oestophora dentata* sp. nov., dorsal (a), apertural (b) and ventral (c) views of two shells, (a) and (b) the holotype. Whitened with ammonium chloride sublimate for photography. Approximately x2. (d) Scanning electron micrograph of the apical whorls of another shell to show surface ornament. x10.

uncertain. *O. boscae* is similar but flatter, the whorls less tumid, the umbilicus is narrower (about 1/10 maximum diameter in *O. boscae*, about 1/15 maximum diameter in *O. dentata*), cylindrical not conical and the last whorl does not tend to uncoil. Finally, there are no hair pits in *O. boscae*.

Of the other species of *Oestophora* only *O. barbula* has denticles in the aperture, but it has two (see GASULL, 1975, figure 33). The new fossil species also differs from all other species in having a wider umbilicus and the plane of the aperture at a higher angle to the axis. Esu's fossil has an even wider umbilicus than the shells from Eivissa (about 1/3 the maximum diameter) and is slightly smaller, but is otherwise very similar.

SUBFAM. HELICINAE

***Iberellus minoricensis* (Mittre, 1842) (figure 13)**

DESCRIPTION. Shell oval, heliciform, imperforate (figure 13h), like a small *Otala*, but more globular (figure 13b, d, e, g). About five whorls, the last descending to the aperture (figure 13e). Surface with irregular growth lines and traces of spiral colour bands. The aperture is elongate oval, weakly reflected and thickened, and with a basal lip in the form of a wall-like plate with traces of an incipient tooth on its upper margin. The plane of the aperture lies at 60° to the axis (figure 13e). The fossil shells are small for the species, reaching only 18.5mm in diameter by 12.5mm in height.

MATERIAL. One whole shell and one apex, six internal moulds.

REMARKS. *Iberellus* is endemic to the Balearic Islands and very variable in both colour patterns and size. These fossil shells are smaller than usual, but otherwise typical.

? *Theba pisana* (Müller, 1774) (figure 14)

DESCRIPTION. Shell medium sized, heliciform, with a pinhole umbilicus (figure 14c), rather flat above, rounded below (figure 14b). With about 4.5 moderately tumid whorls, the last not descending to the aperture. A fragment of external mould shows that the surface is ornamented with fine growth lines only. The aperture is damaged, but round, only very slightly thickened at the base and apparently not reflected at all. The orientation of the plane of the aperture cannot be determined. The solitary internal mould is 22mm in diameter and 14mm high.

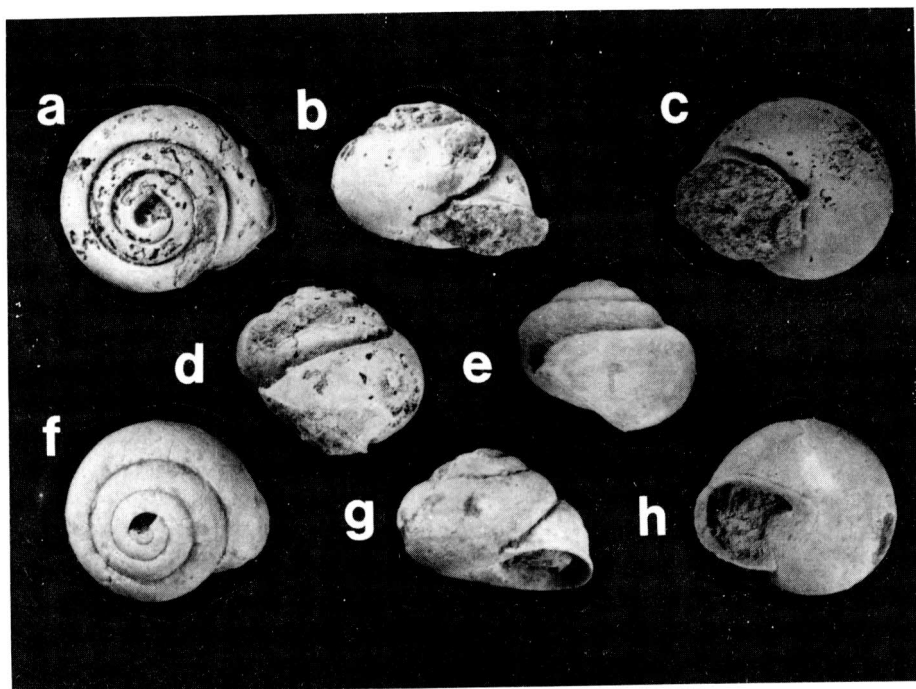


Fig. 13.— *Iberellus minoricensis*. (Mittre, 1842). (a-d) Four views of an internal mould, (e-h) the same standard views of a complete shell. All whitened with ammonium chloride sublimate for photography, all approximately x2.

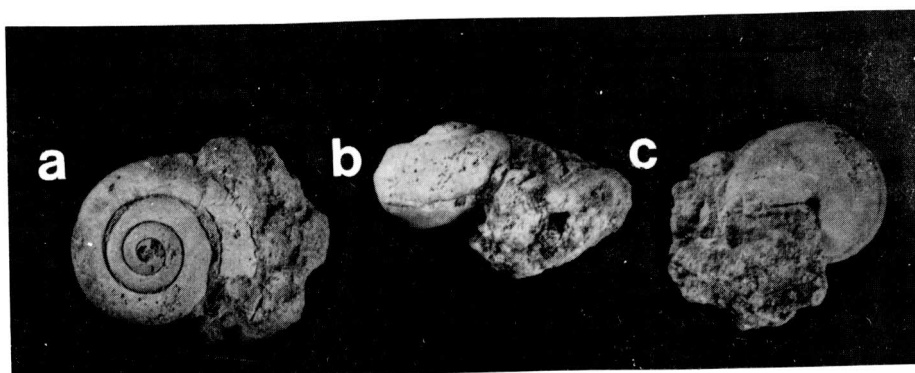


Fig. 14.— ?*Theba pisana* (Müller, 1774). Dorsal (a), apertural (b) and ventral (c) views of the only known specimen, an internal mould. Whitened with ammonium chloride sublimate for photography. Approximately x2.

MATERIAL. One internal mould and a small fragment of the external mould of the same specimen.

REMARKS. The specimen is of the general shape and size of *Theba pisana* and, although the aperture is damaged, it is clear that the last whorl does not descend to the aperture and that the lip is scarcely thickened or reflected, all of which tends to confirm this identification. Currently *Theba pisana* has a very wide distribution and it has been reported from the Pleistocene of North Africa (BIBERSON & JODOT, 1965).

***Otala punctata* (Müller, 1774) (figure 15-16)**

• **DESCRIPTION.** Shell large, heliciform, imperforate (figure 15b). 4.5 whorls, the last expanding and descending sharply towards the aperture (figure 15d). Surface with irregular growth lines and impressed spiral striations. Traces of spiral colour bands and irregular white punctations all over the surface can be seen on shell fragments. The aperture is elongate oval, the lip weakly reflected, slightly thickened and with a nearly vertical wall-like rib basally the upper margin of which bears an incipient tooth. The plane of the aperture lies at 50° to the axis. Shells from Cova de Ca Na Reia reach 32mm in diameter, but none is complete so the height remains unknown.

MATERIAL. Three shell apices, four internal moulds (e.g. figure 15a, c, e) and many fragmentary internal moulds. A few additional shell fragments show the characteristic colour patterns and impressed spiral lines of *Otala punctata* (figure 16).

REMARKS. Two shell fragments show the less crowded spiral lines and irregular punctations characteristic of *O. punctata* rather than *O. lactaea*. At present *O. punctata* is the only species of *Otala* living on Eivissa, but *O. lactaea* occurs on Mallorca and Menorca. Both are almost certainly reintroductions.

***Helix (Cornu) aspersa* (Müller, 1774) (figure 17)**

DESCRIPTION. Shell large, heliciform, imperforate, taller than broad. About four rapidly increasing and descending whorls, moderately tumid above, very strongly rounded below. Material from Cova de Ca Na Reia is all internal moulds so the surface sculpture is unknown. The aperture is rounded, slightly reflected and weakly thickened within. Fossil moulds reach 31mm maximum diameter, but none is complete.

MATERIAL. 11 incomplete internal moulds.

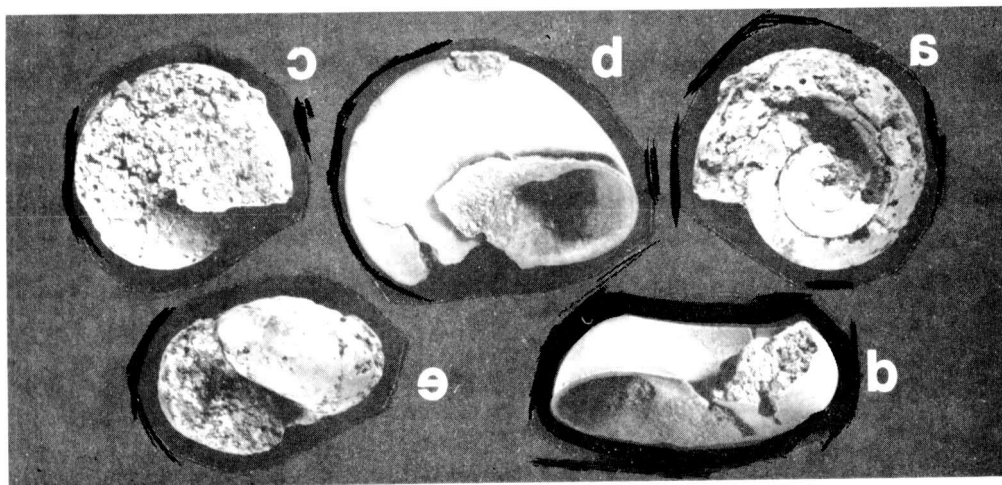


Fig. 15.— *Otala punctata* (Müller, 1774). (a, c, e) Dorsal, ventral and apertural views of an incomplete internal mould. (b, d) Ventral and apertural views of another internal mould showing the mature aperture. All whitened with ammonium chloride sublimate for photography. All approximately x1.5.

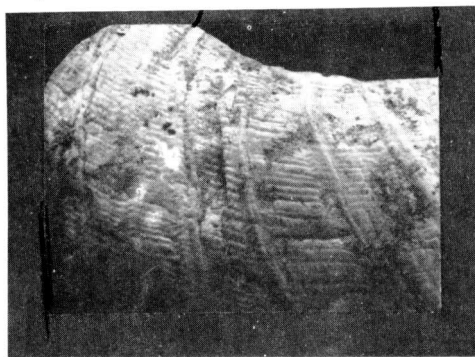


Fig. 16.— *Otala punctata* (Müller, 1774). Scanning electron micrograph of a shell fragment to show surface ornament of impressed spiral lines. x19.

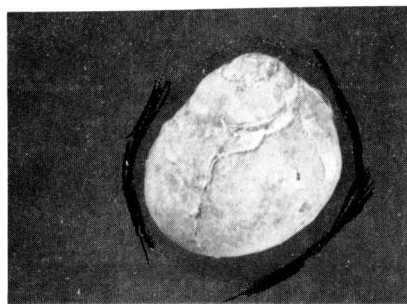


Fig. 17.— *Helix* (*Cornu*) *aspersa* (Müller, 1774). Oblique lateral view of an incomplete internal mould. Whitened with ammonium chloride sublimate for photography. Approximately x2.

REMARKS. The specimens showing the aperture and apex have typical outlines and clearly belong to *H. (C.) aspersa*. It is curious that a species with a relatively thick shell should be known only from internal moulds.

DISCUSSION

The mollusc fauna at Cova de Ca Na Reia is not a typical cave fauna. Of the species present, only *O. pityusanus* might be expected to have lived in caves. Clearly the fauna reflects the species living at the surface in the vicinity of the cave and, almost certainly, the shells were washed into the cave after the snails died. The process occurs commonly in limestone areas. There is no evidence available to prove that the snails lived together in the same area or even at the same time. The varying state of preservation of the shells may indicate that they were washed into the cave over a long period, although the small size of the deposit (see GASULL & ALCOVER, 1982, p. 42) suggests that this was not the case. On the assumption that the fauna accumulated in a short period, geologically speaking, then it must be considered to be older than most mollusc faunas found on the island. Only the fauna at Cala Salada has a similar diversity. Several species are common to both localities and unknown in any other deposits.

Again assuming the mollusc lived together at about the same time, the climate must have been at least as warm as the present day climate. Several of the species are frost sensitive and *Sphincterochila*, in particular, sits out in the sun. Currently, within the Pityuse Islands, it only occurs on the southern coasts of Eivissa and Formentera. The presence of *Oestophora* cf. *dentata* suggests there was a good vegetation cover and relatively moist conditions. This leads me to the conclusion that the fauna reflects the climate of an 'interglacial' rather than a 'glacial' epoch.

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